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## Rehabilitation after lumbar disc surgery

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## Summary

This thesis describes several studies investigating the effectiveness of rehabilitation after surgery for lumbar disc herniation. Currently, postoperative care and management, including referral for rehabilitation after discharge, varies between hospitals and surgeons. Some spinal surgeons always refer patients for postoperative exercise therapy in primary care, whereas others refer only some or none of their patients. To generate evidence on the effectiveness and cost-effectiveness of rehabilitation after lumbar disc surgery we conducted several studies. This evidence should guide future guidelines or updates of existing guidelines on this topic.

A Cochrane review provides an overview of randomised trials that assessed the effectiveness of rehabilitation after lumbar disc surgery. Twenty-two trials investigated post-operative rehabilitation. Most studies assessed the effectiveness of exercise therapy and only results of programs starting 4-6 weeks post-surgery could be pooled. Exercise seemed to lead to a faster decrease in pain and increase in functional status than no treatment, with small to medium effect sizes. High-intensity exercise programs seemed to lead to a slightly faster decrease in pain and increase in functional status than seen with low-intensity programs. However, the overall quality of the evidence was only low to very low, indicating that further research is very likely to have an important impact on the confidence in the estimate of effect and is likely to change the estimate. No significant differences were noted between supervised and home exercise programs for pain or function.

A second Cochrane review summarises 19 trials that assessed exercise therapy for acute non-specific low back pain. Exercise therapy was no better for pain relief or improvement in functional status compared with no treatment or other conservative therapies. In addition, there was no strong evidence that any particular form of exercise therapy was better than another. The evaluation was limited by the small number of studies for outcomes and time intervals for all comparisons, except for exercise therapy versus other conservative treatments. The last comparison included 10 trials.

Based on the knowledge gap we identified in the Cochrane review, we performed a randomised trial to compare two common strategies after surgery for lumbar disc herniation in the Netherlands. In this pragmatic trial the intervention group started their rehabilitation program, based on

a current clinical guideline, immediately after discharge from the hospital. The control group was not referred to any treatment after discharge. The protocol for the intervention group mainly described treatment goals, with a focus on early resumption of activities of daily living. For both groups, 6-8 weeks after discharge a follow-up consult with the neurosurgeon took place. Whether participants in the intervention group continued rehabilitation or control group participants were referred for rehabilitation or other treatment after this follow-up consultation was left to the neurosurgeons' discretion. In total 169 patients who underwent lumbar discectomy were randomly assigned by use of computer-generated blocks to the rehabilitation or control group. At baseline, 3, 6, 9, 12 and 26 weeks postoperatively, global perceived effect, functional status, pain intensity and health-related quality of life were measured. The primary analysis was by intention to treat, using multilevel analysis. There were no clinically relevant or statistically significant differences between the intervention (n=92) and control group (n=77) for any clinical outcome: global perceived effect (GPE) OR 1.0; 95%CI 0.6, 1.7; functional status (ODI) MD 1.5; 95%CI -3.6, 6.7; leg pain (NRS) MD 0.1; 95%CI -0.7, 0.8; back pain (NRS) MD 0.3; 95%CI -0.3, 0.9; general physical health (SF12) MD -3.5; 95%CI -11.3, 4.3; general mental health (SF12) MD -4.1; 95%CI -9.4, 1.3. These results show that referral for early rehabilitation is not more effective than no referral in patients who underwent lumbar discectomy.

Alongside the RCT we conducted an economic evaluation. Cost data were collected at 6, 12 and 26 weeks from a societal perspective. Missing data were multiply imputed. Incremental cost-effectiveness ratios, cost-effectiveness planes and cost-effectiveness acceptability curves were estimated using bootstrapping. The cost-effectiveness study showed that mean total societal costs were €6486 (SD 626) and €6790 (SD 957) for the rehabilitation and control group, respectively. At 26 weeks, no significant cost and effect differences were found. For health-related quality of life, the maximum probability for the intervention to be cost-effective was 0.75 at a willingness-to-pay of €32,000/QALY. Irrespective of the willingness-to-pay, the maximum probabilities of cost-effectiveness for functional status, leg or back pain and recovery were 0.68, 0.70 and 0.70, respectively. These results show that referral for early rehabilitation after lumbar discectomy was not cost-effective compared to no referral.

Adherence to exercises and advice, which were components of the rehabilitation program, is expected to influence the effectiveness of this rehabilitation

program. However, adherence to exercises and recommendations regarding physical activity is known to be problematic. A qualitative study was conducted to assess facilitators and barriers of treatment adherence amongst participants of the trial who received early rehabilitation. We performed a qualitative study using a phenomenological framework, semi-structured individual interviews and thematic analysis. Twelve people who participated in a trial and received rehabilitation after lumbar discectomy were interviewed. Surgery was often experienced as a major event by the patient, in contrast to the neurosurgeons who saw lumbar discectomy as a minor operation, according to the respondents. The main barriers of adherence to exercise and advice were fear of pain aggravation and subsequent activity avoidance immediately post-surgery and perceived poor practical skills to cope with all treatment requirements. Opportunities to ask questions and receiving information and reassurance were welcomed and mentioned as helpful to overcome this fear of pain aggravation and activity avoidance. This emphasises the need for personalised, patient-centred care after lumbar disc surgery. Key facilitators to adherence were expected recovery and treatment efficacy; a decrease in pain or other symptoms and expected preventative effect, which were contributed to performing exercises or following advice regarding daily activities; perceived sufficient practical skills to perform home exercises and to follow advice; a strong belief that exercises were needed for recovery which enhanced skills to find solutions to any perceived time constraints. Finally, therapist involvement which was tailored to the participant's needs was an important facilitator. A first type of therapist involvement consisted of merely providing information and feedback for patients taking full responsibility for their own recovery. A more extensive therapist involvement offering a structured approach and supervision was the second type, needed for patients with perceived limited coping skills. Finally, the third type was described as a collaborative approach, suitable for those patients with sufficient practical skills. This type included providing information and advice, inquiring about the patient's experiences, providing feedback, being a motivator and enhancing practical skills if needed.

This thesis concludes with a discussion of the methodology and results of all studies included and recommendations for research and clinical practice. Identifying subgroups of patients experiencing limited recovery or chronification of pain is important, as is the unraveling of mechanisms influencing recovery. The results presented in this thesis have also some clinical implications. For patients who underwent lumbar disc surgery, an

early rehabilitation intervention was neither effective nor cost-effective compared to no referral for early rehabilitation. Based on a systematic review of the literature, rehabilitation starting some 6 weeks after surgery was found to be slightly more effective than no treatment. An initial watchful waiting policy might therefore be advised, with referral for rehabilitation in case of persisting complaints. For therapists providing this treatment it is important to take patient preferences for the level of therapist involvement into account to enhance adherence to home exercises and treatment advice.